ML assignment :

Dataset :

- Annotated dataset of around 3k images which has locations of defects (bounding box)

Problem statement :

- Based on the given dataset, identifying if a given image is healthy/ not - binary classification
  — **Problem statement 1**
  (using custom model from scratch)

- Based on the given dataset, predict multi-label classification using custom model
  Dataset is not being loaded due to out of memory error (since it has shape len * 6 (classes) * 224 * 224 * 3)

- Based on the given dataset , predict & localize multiclasses using pretrained model
  (By fine tuning the model, making it customized to the dataset)
  — **Problem statement 2**

Classification folder refers to problem statement 1
Detection folder refers to problem statement 2

Problem statement 1:

Pipeline :

- *Data Preparation* (loading the data & modifying the paths as per requirement)

- *Data preprocessing*
  resize the image (since we have multiple shapes) to (224,224)
  Normalize the pixel values to [0,1]

- *Data augmentation*
  Flipping
  Rotation
  Brightness
  Width, height shift

- *Models*
  - Manual feature selection:
  Trained the model using HOG, LBP and use random forest for classification

- CNN model : (auto feature selection using CNN & trained with augmented dataset)

- *Inferences*

```
+---------------------------------+------------+
| Model                           |  Accuracy  |
+=================================+============+
| HOG + Random Forest (original)  |  0.902778  |
+---------------------------------+------------+
| LBP + Random Forest (original)  |  0.87963   |
+---------------------------------+------------+
| CNN + Augmentation (augmented)  |  0.890432  |
+---------------------------------+------------+
```
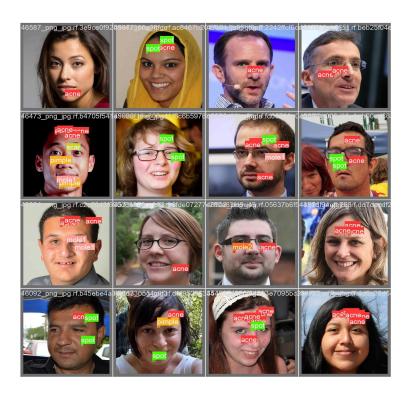
Problem statement 2:

Pipeline:

- Extracted the dataset from roboflow
  (in yolov5 format)
- Seperated the dataset into train, validation classes for gaining the prediction
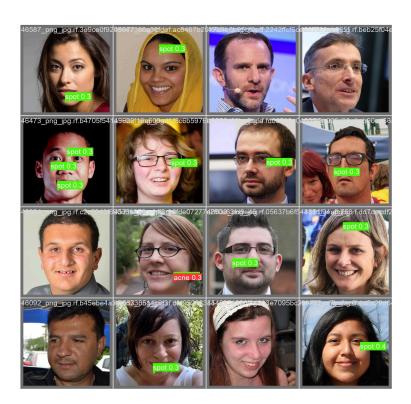- Adjusted the path variables in .yml file & constrained hyperparameters for low training time.

Inferences:

- Following defects are identified in a better way in the given order: *spot, acne, mole, pimple..*

Actual image:

Predicted:

Predictions couldn't identify acne/pimple/ other classes in better way compared to spots due to:

- low epochs : 5
    Since the model is taking very high training time : around 37 minutes for a epoch, I've restricted the model to 5 epochs instead of general 20/50 range

- Low quality dataset:
    Dataset isn't preprocessed (resized) & augmented (which reduces its robustness)
    Also the dataset lacks the diversity among the classes & annotation isn't upto the mark for some images as well

- Too small bounding box: Adding to the less amount of data, bounding box size is also too small which is making it difficult to differentiate between similar classes

Future work:

- Preprocess the dataset before hand to ensure all images are of similar shape

- Normalize the image pixels as part of pre-processing for better convergence

- Augmented the dataset by flipping, rotating, brightness, contrast ... to ensure robustness

- Increase the epochs and ensure model is being trained with GPU for faster execution

- If model predicts similar to the labels, we can evaluate using IOU & other evaluation metrics

- Mole class can be removed since it doesn't come under curable defect, instead we can add whiteheads (manual annotation ...)